

Exotic Pests of Concern for Ornamental Plants



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests



Introduction

- Exotic Arthropod Pests

- Red palm weevil
- Daylily leaf miner
- Japanese maple scale
- Passionvine mealybug
- Red palm mites
- Tremex wood wasp
- Sirex wood wasp
- Brown marmorated stink bug
- European pepper moth

- Exotic Diseases

- Red ring disease of palms
- Boxwood blight
- Impatiens downy mildew
- Chrysanthemum white rust
- Texas Phoenix palm decline
- Bleeding canker of horse chestnut



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Exotic Arthropods



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Red Palm Weevil

Has been
found and
eradicated

- *Rhynchophorus ferrugineus*
 - Distribution
 - Native to Asia, spread to Middle East, Portugal, Spain
 - First detected in US in California in 2010
 - Hosts
 - Palms, American Agave, sugarcane
 - Attracted to wounded plants



Image Credit:
John Kabashima, University of California
Bugwood.org, #5444382



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests



Has been
found and
eradicated

Red Palm Weevil



Image Credit:

Top Left: Mike Lewis, Center for Invasive Species Research, Bugwood.org, # 5430201

Bottom Left: Amy Roda, USDA-APHIS

Right: Christina Hoddle, University of California,
Bugwood.org, # 5430200



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests



Red Palm Weevil

Has been
found and
eradicated



Image Credit;
Amy Roda, USDA-APHIS



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Red Palm Weevil

Has been
found and
eradicated



Image Credit;
Amy Roda, USDA-APHIS).



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests



Has been
found and
eradicated

Red Palm Weevil

- Management

- Monitoring

- Cultural

- Sanitation

- Sealants

- Groundcover

- Chemical*

- Carbaryl, chlorpyrifos, diazinon, endosulfan, fipronil, imidacloprid, malathion, acephate, azinphos-methyl, methidathion, demethoate, trichlorfon



Monitoring bucket.
Image Credit; Amy Roda, USDA-APHIS).



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

*Be sure to check with your local county agent to find out which chemicals are certified for use in your state, on what crop it is allowed to be used, if it is allowed to be used post-harvest or pre-harvest, and if it should be applied by a licensed applicator.

Palm Weevil Similarities



Red palm
weevil

Palmetto palm
Weevil – red form

Palmetto palm
Weevil – black form

South American
palm Weevil

Image Credit:
Charles Bronson, FDACS-DPI



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Daylily Leaf Miner

Has been found but is limited in its distribution

- *Ophiomyia kwansonis*
 - Distribution
 - Native to Japan and Taiwan
 - First detected in US in Maine in 2006
 - Has been reported in NY, PA, MD, WV, VA, NC, SC, GA, AL, FL, LA, MS, and TX
 - Host
 - Daylilies



Daylily Leaf Miner

Has been found but is limited in its distribution

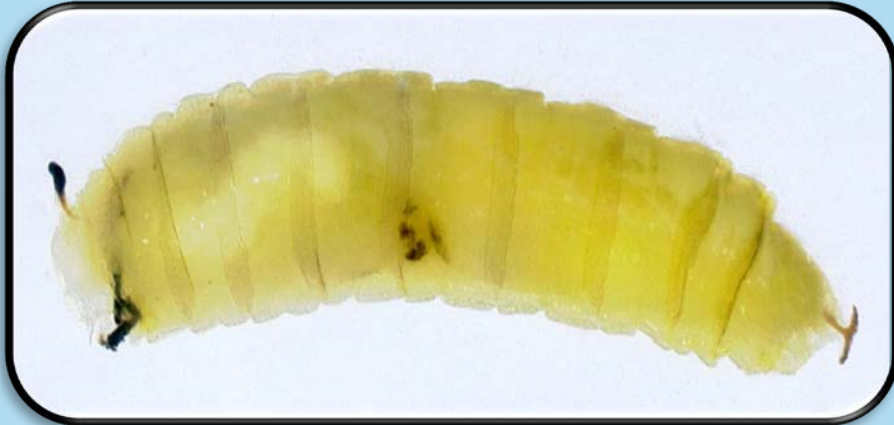


Image Credit:

Top Right:Gaye Williams, Maryland Dept. of Agriculture

Top Left, Bottom Left and Right: Gary Steck, FDACS-DPI



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Daylily Leaf Miner

Has been
found but is
limited in its
distribution



Image Credit:
Gary Steck, FDACS-DPI



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Daylily Leaf Miner

Has been found but is limited in its distribution



Image Credit:
Gary Steck, FDACS-DPI



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests



Daylily Leaf Miner

Has been
found but is
limited in its
distribution

- Management
 - Good sanitation practices are paramount
 - Removal and destruction of infested leaves
 - Must be sure to remove entire leaf; larvae could hide within low chlorophyll containing leaf tissue near leaf base.
 - Hard to manage fly population
 - Can overwinter on wild *Hemerocallis* spp.



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Japanese Maple Scale

Has been found but is limited in its distribution

- *Lopholeucaspis japonica*
 - Distribution
 - Asia, South America, Australia, and North America
 - Hosts include:
 - Magnolia, Maple, *Euonymus*, Holly, Privet, Willow, Elm, and Camellia.



Japanese Maple Scale

Has been found but is limited in its distribution

Adults



Crawlers with adults



Japanese Maple Scale

Has been found but is limited in its distribution

- Damage on tree and a heavy infestation

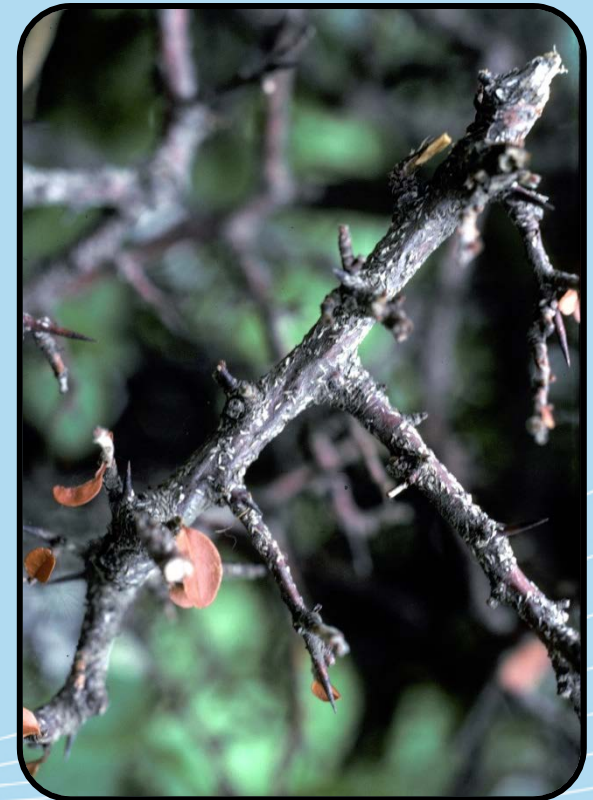


Image Credit

United States National Collection of Scale Insects Photographs Archive, USDA Agricultural Research Service, www.bugwood.org, #5123020, and Brian Kunkel, University of Delaware, www.bugwood.org, #5429866



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests



Japanese Maple Scale

Has been found but is limited in its distribution

- Management
 - Mechanical
 - Sanitation, high pressure water sprayer, scrub brush
 - Chemical*
 - pyrethroids, buprofezin, pyriproxyfen, dinotefuran, clothianidin, and horticultural oils
 - Detection

*Be sure to check with your local county agent to find out which chemicals are certified for use in your state, on what crop it is allowed to be used, if it is allowed to be used post-harvest or pre-harvest, and if it should be applied by a licensed applicator.



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Passionvine Mealybug

Has been found but is limited in its distribution

- *Planococcus minor*
 - Distribution
 - Bermuda, Mexico, Central America, South America, Australia
 - Hosts
 - Polyphagous feeder, tremendous host range
 - such as banana, citrus, cocoa, coffee, corn, grape, mango, potato, and soybean



Passionvine Mealybug

Has been found but is limited in its distribution



Image Credit:

Top left: Joel Miles, Office of Environmental Response and Coordination, www.bugwood.org, #2102097

Bottom left: Joel Miles, Office of Environmental Response and Coordination, www.bugwood.org, #2102096

Right: United States National Collection of Scale Insects Photographs Archive, USDA Agricultural Research Service, www.bugwood.org, #5110100



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Passionvine Mealybug

Has been found but is limited in its distribution

- Risk Assessment:

- Climate

- 52% of the Continental U.S. Has a suitable climate for this pest to become established

- Host availability

- 80 plant families including 250 different host plants

- Time consuming and exhaustive survey methods

- New pheromone bait traps have been successful in luring *P. minor*



Passionvine Mealybug

Has been found but is limited in its distribution



Pictures of a closely related mealybug, *Planococcus citri*



Image Credit:

Left: Jeffrey Lotz, FDACS, Bugwood.org, #5195055

Right: USDA Agricultural Research Service, Bugwood.org, #5137040



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Passionvine Mealybug

Has been found but is limited in its distribution

- Management
 - Biological Control



Example of a Syrphidae



Diomus sp.



Example of a Anthocoridae

Image Credit:

Sonya Broughton, Department of Agriculture & Food Western Australia,, www.bugwood.org, #5186088;
Bradley Higbee, Paramount Farming, www.bugwood.org, #9005024, and Clemson University - USDA
Cooperative Extension Slide Series, www.bugwood.org, #1236079



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests



Red Palm Mites

Has been
found but is
limited in its
distribution

- *Raoiella indica*
 - Distribution
 - Asia, the Middle East, South America, and North America
 - Hosts
 - Primary Hosts: Palm family
 - Secondary Hosts: Banana family
 - Also reported on: *Pandanus* spp., Heliconia, and bird of paradise plants



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Red Palm Mites

Has been found but is limited in its distribution



Red palm mite egg



Image credit:
Rita Duncan, University of Florida
Lyle Buss, Department of Entomology and Nematology, University of Florida
egg - Wikimedia commons



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Red Palm Mites

Has been found but is limited in its distribution



Damage on banana leaves

Damage on palm fronds



Image credit:
Wikimedia commons



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests



Red Palm Mites

Has been found but is limited in its distribution

- Management

- Biological Control

- Mites, Beetles, Thrips, Lacewings, Parasitic Fungi

- Cultural

- Sanitation

- Chemical*

- Phosphamidon, monocrotophos, dimethoate, formothion and demeton methyl
 - petroleum, neem, and horticultural oil
 - pyridaben, fenbutatin-oxide and dicofol; tank mix with sulfur.

*Be sure to check with your local county agent to find out which chemicals are certified for use in your state, on what crop it is allowed to be used, if it is allowed to be used post-harvest or pre-harvest, and if it should be applied by a licensed applicator.



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Tremex Wood Wasp

- *Tremex fuscicornis*
 - Distribution
 - Asia, Australia, Europe, and South America
 - Host
 - Beech, Poplar, Elm, Alder, Chinese wingnut, English walnut, birch, maple, black locust, willow, oak, Chinese hackberry, *Prunus* spp., European hornbeam



Not found here
yet

Tremex Wood Wasp



Not found here
yet

Tremex Wood Wasp



Image credit:
Stanislav Krejčík www.meloidae.com



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Tremex Wood Wasp

- Management
 - Mechanical
 - Use of fumigants or heat
 - Cultural
 - Proper watering and pruning
 - Removal of cut wood and logs
 - Sanitation
 - Biological
 - Entomopathogenic Nematodes
 - Ichneumonid Wasps and other Predators



Sirex Wood Wasp

Has been found but is limited in its distribution

- *Sirex noctilio*
 - Distribution
 - Africa, Asia, Australia, Europe, South America, and North America
 - Hosts
 - Conifers, especially pine
 - Can also use fir, larch, spruce, and Douglas fir

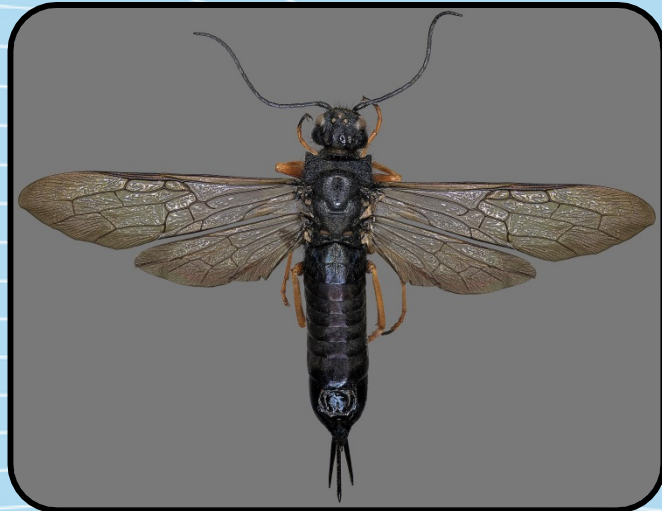


Sirex Wood Wasp

Has been
found but is
limited in its
distribution



male



female



larva

Image credit:
Steven Valley, Oregon Department of Agriculture, www.bugwood.org, #5455076 and #5455071; Dennis Haugen,
www.bugwood.org, #1393017



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Sirex Wood Wasp

Has been found but is limited in its distribution

- Damage





Sirex Wood Wasp

Has been found but is limited in its distribution

- Management
 - Mechanical
 - Use of fumigants or heat
 - Cultural
 - Proper watering and pruning
 - Removal of cut wood and logs
 - Sanitation
 - Biological
 - Entomopathogenic Nematodes
 - Ichneumonid Wasps and other Predators



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Brown Marmorated Stink Bug

Has been found but is limited in its distribution

- *Halyomorpha halys*
 - Distribution
 - Asia (China, Japan, Korea Republic, Taiwan), Europe (Switzerland), North America (Canada and U.S.)
 - Host
 - Polyphagous, very wide host range. Agricultural, ornamental, vegetable and other crops.



Brown Marmorated Stink Bug

Has been found but is limited in its distribution



Eggs



Juvenile



Adult





Brown Marmorated Stink Bug

Has been
found but is
limited in its
distribution

- Management
 - Biological
 - Birds, Parasitic Wasps
 - Chemical*
 - Bifenthrin, dinotefuran, and other pyrethroids
 - Physical (Homeowners)
 - Seal holes in house and windows
 - Weather Strip doors and entrances
 - Use of shopvac filled with soapy water
 - Monitoring
 - Black Pyramid Ground trap
 - Blue, black, white lights

*Be sure to check with your local county agent to find out which chemicals are certified for use in your state, on what crop it is allowed to be used, if it is allowed to be used post-harvest or pre-harvest, and if it should be applied by a licensed applicator.



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

European Pepper Moth

Has been found but is limited in its distribution

- *Duponchelia fovealis*
 - Distribution
 - Africa, Asia, Europe, and North America
 - Hosts
 - Very wide host range including tomatoes, strawberries, peppers, English daisies, Lisianthus, poinsettia, begonia, and impatiens
 - Detritus



Image credit:

Carmelo Peter Bonsignore, Università degli Studi Mediterranei di Reggio Calabria



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

European Pepper Moth

Has been found but is limited in its distribution



pupa



adult



caterpillar

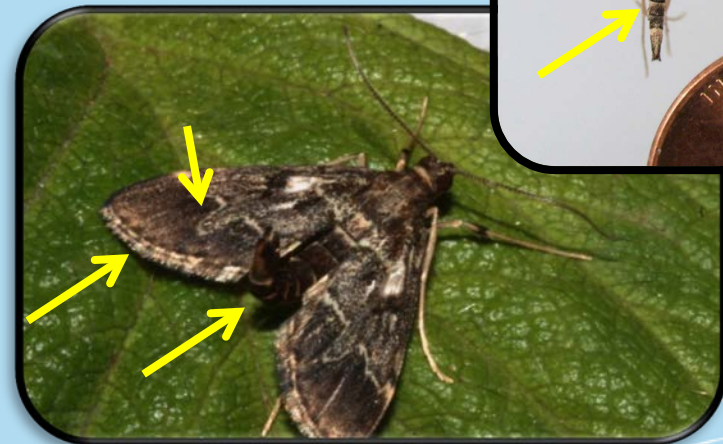


Image credit:

Henk Stigter, Plant Protection Service, National Reference Centre, The Netherlands; Carmelo Peter Bonsignore, Università degli Studi Mediterranei di Reggio Calabria; James Hayden, Florida Department of Agriculture and Consumer Services, Division of Plant Industry



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

European Pepper Moth

Has been found but is limited in its distribution



Image credits:

Carmelo Peter Bonsignore, Università degli Studi Mediterranei di Reggio Calabria; Marja van der Straten, Plant Protection Service, Wageningen, The Netherlands; Bryan Vander Mey, Department of Entomology, University of California, Riverside; Henk Stigter, Plant Protection Service, National Reference Centre, The Netherlands



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

European Pepper Moth

Has been found but is limited in its distribution

- Management
 - Monitoring and Inspection
 - Cultural
 - Removal of detritus and leaves in lower canopy
 - Chemical*
 - Biological
 - Mites, Beetles, Entomopathogenic Nematodes, Parasitic Wasps, Bt formulation



Image credit:
Dr. Peter van Deventer, Plant Research International,
Wageningen, The Netherlands

*Be sure to check with your local county agent to find out which chemicals are certified for use in your state, on what crop it is allowed to be used, if it is allowed to be used post-harvest or pre-harvest, and if it should be applied by a licensed applicator.



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Exotic Diseases



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Red Ring Disease of Palm

Not found here
yet

- Disease caused by a nematode
 - *Bursaphelenchus cocophilus*
 - Coconut Palm Nematode
- The nematodes are vectored by a beetle
 - *Rhynchophorus palmarum*
 - South American Palm Weevil
- Distribution
 - Caribbean and Central America, South America, and North America
- Hosts
 - Nematode is restricted to species found in the palm family
 - Vector can feed on species other than palms



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Vector of Red Ring Disease of Palm

Not found here
yet



Image Credit:
Left Images: Jennifer Duque, University of Puerto Rico, Bugwood.org,
5411179, 5411179
Right: Robin Giblin-Davis, University of Florida



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Red Ring Disease of Palm

Not found here
yet

- Damage is similar to Red Palm Weevil.
- Wounds from laid eggs
- Palm toppling from reduced structural stability.



Image Credit:
Robin Giblin-Davis, University of Florida



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Red Ring Disease of Palm

Not found here
yet



Image Credit:
Robin Giblin-Davis, University of Florida



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests



Red Ring Disease of Palm

Not found here
yet

- Management
 - Very difficult to manage
 - Sanitation is most effective
 - Chemical*
 - carbaryl, chlorpyrifos, diazinon, endosulfan, fipronil, imidacloprid, malathion, acephate, azinphos-methyl, methidathion, demethoate, trichlorfon
 - Nematicides on leaf axils
 - The same traps used for the Red Palm Weevil will attract the South American Palm Weevil

*Be sure to check with your local county agent to find out which chemicals are certified for use in your state, on what crop it is allowed to be used, if it is allowed to be used post-harvest or pre-harvest, and if it should be applied by a licensed applicator.



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Boxwood Blight

Has been found but is limited in its distribution

- *Cylindrocladium pseudonaviculatum*
 - Distribution
 - Throughout Europe (i.e. U.K., Italy, Spain) and New Zealand.
 - In the U.S.
 - Hosts
 - Boxwood, sweet box or Christmas box, Japanese spurge



Image Credit:

A. Rawlins, University of Georgia, www.bugwood.org, #5458099



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Boxwood Blight

Has been found but is limited in its distribution

- Boxwood blight on leaves



Image Credit:

Sandra Jensen, Cornell University, www.bugwood.org, #5484089 and #5484088



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests



Boxwood Blight

Has been
found but is
limited in its
distribution

- Boxwood blight fungal fruiting bodies



Image Credit:

Sandra Jensen, Cornell University, www.bugwood.org, #5457981 and #5458095



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Boxwood Blight

Has been found but is limited in its distribution

- Volutella blight



Image Credit:

Florida Division of Plant Industry Archive, Florida Department of Agriculture and Consumer Services, www.bugwood.org, #5260010 and #5260007



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests



Boxwood Blight

Has been found but is limited in its distribution

- Management

- Sanitation

- destruction of leaves and removal of inoculated soil (if severe infection, remove whole plant)

- Chemical*

- fludioxinil, azoxystrobin, mancozeb, chlorothalonil, carbendazim, kresoxim-methyl, pyraclostrobin

- Avoid overhead watering

- Use of adequate spacing

- Plant alternative plants

*Be sure to check with your local county agent to find out which chemicals are certified for use in your state, on what crop it is allowed to be used, if it is allowed to be used post-harvest or pre-harvest, and if it should be applied by a licensed applicator.



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Impatiens Downy Mildew

Has been found but is limited in its distribution

- *Plasmopara obducens*
 - Distribution
 - Throughout Europe, U.S., Canada, Guatemala, Costa Rica.
 - Hosts
 - Impatiens and wild balsam



Impatiens Downy Mildew

Has been found but is limited in its distribution



Image Credit:
Laura Sanagorski, University of Florida



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Impatiens Downy Mildew

Has been found but is limited in its distribution



Image Credit:
Mary Ann Hansen, Virginia Polytechnical Institute and State University, Bugwood.org, #5485738 and #5485739



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Impatiens Downy Mildew

Has been found but is limited in its distribution

- Management
 - Sanitation
 - removal of infected leaves, do not compost infected material, use non-impatiens plant material (“crop rotation” in greenhouse/nursery)
 - Chemical*
 - fluopicolide, fenamidone, dimethomorph, mefenoxam, azoxystrobin.
 - Plant New Guinea Impatiens

*Be sure to check with your local county agent to find out which chemicals are certified for use in your state, on what crop it is allowed to be used, if it is allowed to be used post-harvest or pre-harvest, and if it should be applied by a licensed applicator.



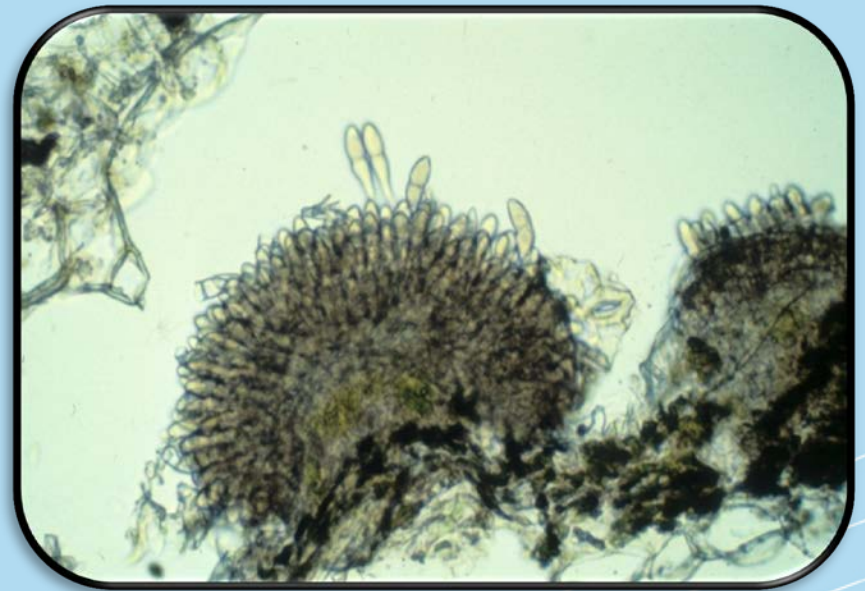
protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Chrysanthemum White Rust

Has been
found and is
under
eradication

- *Puccinia horiana*
 - Distribution
 - Asia, Africa, South and Central America, Australia, New Zealand, North America and Europe
 - Hosts
 - Chrysanthemums



Chrysanthemum White Rust

Has been
found and is
under
eradication



Image Credit:

Top Left: Central Science Laboratory, Harpenden Archive, Bugwood.org, #0454039

Bottom Left: Daniel Kepich, USDA-APHIS-PPQ, Bugwood.org, #1460044

Top Right: Florida Division of Plant Industry Archive, Bugwood.org, #5265030

Bottom Right: SRPV, Bourgogne Archive, Bugwood.org, # 0725008



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests



Chrysanthemum White Rust

Has been
found and is
under
eradication

- Management
 - Changing cultural practices to prevent conditions from becoming conducive for CWR
 - Use of effective fungicides, off-site shipping area (sanitary purposes), use fungicidal dip to prevent spread of fungus (cut flowers)
 - oxycarboxin, triforine, benodanil, triadimefon, diclobutrazol, dibitertanol and propiconazole, difenoconazole, myclobutanil, tebuconazole, and triticonazole
 - Monitoring host plants for the pathogen

*Be sure to check with your local county agent to find out which chemicals are certified for use in your state, on what crop it is allowed to be used, if it is allowed to be used post-harvest or pre-harvest, and if it should be applied by a licensed applicator.



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Chrysanthemum White Rust

Has been
found and is
under
eradication

- This pest is currently on the USDA Quarantine Pest List.
 - If host plants are found to be infected with this disease, commercial growers should consult this eradication plan regarding Chrysanthemum White Rust.
- http://www.aphis.usda.gov/plant_health/plant_pest_info/cwr/downloads/cwrplan.pdf



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Texas Phoenix Palm Decline

Has been
found but is
limited in its
distribution

- Caused by a Phytoplasma (a bacterium without a cell wall), like Lethal Yellows
 - Distribution
 - Texas and Florida
 - Hosts
 - Canary date palm, date palm, silver date palm, Queen palm, and Sabal palm



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Texas Phoenix Palm Decline

Has been
found but is
limited in its
distribution

- Initial symptoms



Fruit drop from a date palm



Death of the flowers

Texas Phoenix Palm Decline

Has been
found but is
limited in its
distribution

- Initial symptoms



Discoloration of the leaves begin
at the tip



Discoloration of the lowest (older)
leaves comes next

Image Credit:
University of Florida



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Texas Phoenix Palm Decline

Has been
found but is
limited in its
distribution



- Progression of symptoms
 - Death of the spear leaf
 - Broken roots
 - Ability to “rock” the palm

Image Credit:
University of Florida



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests



Texas Phoenix Palm Decline

Has been
found but is
limited in its
distribution

- Management
 - No specific vector identified
 - Hard to control vectors
 - No cure at this time
 - Removal of infected plant material
 - Anti-biotic injections



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Bleeding Canker of Horse Chestnut

Not found here
yet

- *Pseudomonas syringae*
pv. *aesculi*
 - Distribution
 - United Kingdom, Ireland, the Netherlands, Belgium, France, Germany, India
 - Hosts
 - Horse chestnuts and buckeyes





Not found here
yet

Bleeding Canker of Horsechestnut

- Symptoms





Not found here
yet

Bleeding Canker of Horsechestnut

- Management
 - No current chemical control
 - Disease progress monitoring
 - Good sanitation practices
 - Grow from seed/do not import plants



Questions?

- For more information, check out www.protectingusnow.org
- You can also contact:
 - Amanda Hodges, University of Florida, achodges@ufl.edu
 - Stephanie D. Stocks, University of Florida, sstocks@ufl.edu



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Author Credits and Date of Publication

- John Bonkowski, B.S., graduate student in the Doctor of Plant Medicine Program, University of Florida
- Stephanie Stocks, M.S., Assistant –In, Extension Scientist, Department of Entomology and Nematology, University of Florida
- July 2013



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Reviewers Credits

- Amanda Hodges, Ph.D., Associate Extension Scientist, Department of Entomology and Nematology, University of Florida
- Stephen Mclean, DPM, Department of Entomology and Nematology, University of Florida
- Stephen Arthurs, Ph.D., Assistant Professor of Entomology, University of Florida Mid-Florida Research and Education Center



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Educational Disclaimer and Citation

- This presentation can be used for educational purposes for NON-PROFIT workshops, trainings, etc.
- Citation:
 - Bonkowski , John and Stephanie Stocks. 2013. Exotic Pests of Concern for Ornamental Plants. accessed (add the date) – www.protectingusnow.org.



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

Our Partners

Much of the authorship of e-learning content has occurred through partnerships. Some of our partnering organizations have included:



[National Institute of Food and Agriculture \(NIFA\)](#)



[Center for Invasive Species and Ecosystem Health](#)
(i.e. the Bugwood Network)



[Local and Regional Integrated Pest Management programs \(IPM\)](#)



[USDA-APHIS](#)



[U.S. Department of Homeland Security \(DHS\)](#)



[Extension Disaster Education Network \(EDEN\)](#)



[U.S. Forest Service](#)



[Cooperative Agriculture Pest Survey Program \(CAPS\)](#)



[National Plant Board \(NPB\) and State Departments of Agriculture](#)



[National Plant Diagnostic Network \(NPDN\)](#)



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

References

- American Nursery and Landscape Association. 2012. Boxwood Blight: Where we are and where we hope to be. Webinar. Accessed 10-20-12
 - <http://www.anla.org/knowledgecenter/premium/index.cfm?view=player&colid=112&cid=324&mfid=5311&StartNum=1&CFID=4233125&CFTOKEN=16935991>
- Bertone, Christie. Michalak, P. and Roda, Amy. 2011. New Pest Response Guidelines: Red Palm Weevil, *Rhynchophorus ferrugineus*. USDA-APHIS-PPQ-CPHST. Accessed 9/30/2012-
 - http://www.aphis.usda.gov/import_export/plants/manuals/emergency/downloads/nprg-redpalmweevil.pdf
- CABI Invasive Species Compendium. 2010. *Tremex fuscicornis* (Tremex wasp). Accessed 12-24-12
 - <http://www.cabi.org/isc/?compid=5&dsid=54516&loadmodule=datasheet&page=481&site=144>
- Center for Invasive Species Research. Red Palm Weevil. Accessed 9/30/2012-
 - http://cistr.ucr.edu/red_palm_weevil.html
- Ciesla, W. 2003. *Tremex fuscicornis*. North American Forest Commission, Exotic Forest Pest Information System. Accessed 12-24-12
 - <http://spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=157&langdisplay=english>
- Commonwealth Scientific and Industrial Research Organisation (CSIRO). 2004. Passionvine Mealybug. Australia Government, Department of Agriculture, Fisheries, and Forestry. Accessed 12-24-12
 - http://www.ces.csiro.au/aicn/name_c/a_3097.htm
- Cooperative Agricultural Pest Survey. 2012. Survey Status of Sirex Woodwasp -- *Sirex noctilio*. Accessed 12-25-12
 - <http://pest.ceris.purdue.edu/map.php?code=ISBBADA>
- Cooperative Agricultural Pest Survey. 2011. *Pseudomonas syringae* pv. *aesculi*. Accessed 12-17-12
 - http://caps.ceris.purdue.edu/webfm_send/945
- Douglas, Sharon. 2012. Boxwood Blight – A new disease for Connecticut and the U.S. Accessed 7/19/2013
 - <http://www.ct.gov/caes/cwp/view.asp?a=3756&q=500388>



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

References

- EPPO. Data Sheets on Quarantine Pests: *Puccinia horiana*.
- EPPO. 2005. Diagnostics: *Lopholeucaspis japonica*. Bulletin OEPP/EPPO Bulletin 35, Pg 345-347.
- EPPO. 2007. *Rhynchophorus ferrugineus* and *Rhynchophorus palmarum* (Diagnostics). European Mediterranean Plant Protection Organization Bulletin 37: 571-579.
- EPPO. 2008. *Plasmopara obducens* (a downy mildew on impatiens). accessed 7/19/2013
 - http://www.google.com/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&cad=rja&ved=0CDAQFjAA&url=http%3A%2F%2Fwww.eppo.int%2FQUARANTINE%2FAlert_List%2Fdeleted%2520files%2Ffungi%2FPlasmopara_obducens.doc&ei=4I7pUc_tA4e28wSN4IDACw&usg=AFQjCNF__uxkgqyVQkgZHiVe1Hzvy7Sfrw&sig2=3U38aRspOY4U2c4JYZp5-w&bvm=bv.49478099,d.eWU
- EPPO/CABI. Data Sheets on Quarantine Pests: *Lopholeucaspis japonica*. Accessed 12-17-12
 - http://www.eppo.int/QUARANTINE/insects/Lopholeucaspis_japonica/LOPLJA_ds.pdf
- European and Mediterranean Plant Protection Organization. 2010. *Pseudomonas syringae* pv. *aesculi*. Accessed 12-17-12
 - http://www.eppo.int/QUARANTINE/Alert_List/bacteria/Pseudomonas_s_aesculi.htm
- Francis, A., M. Kairo, and A. Roda. 2011. Passionvine Mealybug, *Planococcus minor* (Maskell) (Hemiptera: Pseudococcidae). University of Florida, Institute of Food and Agricultural Sciences. Accessed 12-24-12
 - <http://edis.ifas.ufl.edu/in920>
- Francis, A., M. Kairo, A. Roda, O. Liburd, and P. Polar. 2012. The passionvine mealybug, *Planococcus minor* (Maskell) (Hemiptera: Pseudococcidae) and its natural enemies in the cocoa ecosystem in Trinidad. Biological Control 60(3): 290-296.
- Fulcher, A., F. Hale, M. Halcomb. 2011. Japanese Maple Scale: An important New Insect Pest in the Nursery and Landscape. University of Tennessee Extension. accessed 7/19/2013
 - <https://utextension.tennessee.edu/publications/Documents/W277.pdf>



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

References

- Gill, S., S. Klick, and S. Kenney. 2010. Brown Marmorated Stink Bug (*Halyomorpha halys*). University of Maryland Extension Service. Accessed 1-5-13
 - <http://www.ipmnet.umd.edu/landscape/docs/BMSB-UMD.pdf>
- Gill, S., P. Shrewsbury, J. Davidson. 2011. Japanese Maple Scale (*Lopholeucaspis japonica*): A Pest of Nursery and Landscape Trees and Shrubs. University of Maryland Extension. accessed 7/13/2013
 - <http://ipmnet.umd.edu/nursery/docs/JapaneseMapleScale-UMD2011.pdf>
- Goere, M.E. 2008. White rust outbreaks on chrysanthemum caused by *Puccinia horiana* in Turkey. Plant Pathology Vol 57, 4, Pg 786.
- Greenhouse Grower. 2012. Everything you needed to know about Impatiens downy mildew. Accessed 11-05-12
 - <http://www.greenhousegrower.com/article/32104/everything-you-need-to-know-about-impatiens-downy-mildew>
- Great Britain Forestry Commission. 2012. Bleeding Canker of Horse Chestnut. Accessed 12-17-2012
 - <http://www.forestry.gov.uk/website/forestresearch.nsf/ByUnique/INFD-6KYC2W>
- Gyltshen, J., G. Bernon, A. Hodges, S. Stocks, and J. Brambila. 2011. Featured Creatures: Brown Marmorated Stink Bug (*Halyomorpha halys* Stål). University of Florida. Accessed 1-5-13
 - http://entnemdept.ufl.edu/creatures/veg/bean/brown_marmorated_stink_bug.htm
- Halbert, S. 2008. Pest Alert: Texas Phoenix Palm Decline. Florida Department of Agriculture and Consumer Sciences, Division of Plant Industry. Accessed 12-24-12
 - <http://www.freshfromflorida.com/pi/pest-alerts/texas-phoenix-palm-decline.html>
- Halcomb, M. and F. Hale. 2012. Scale – White Peach and Japanese Maple Scale. University of Tennessee Extension. accessed 7/19/2013
 - http://www.utextension.utk.edu/mtnpi/handouts/Insect%20&%20Disease%20Control/Scale--White_Peach_and_Japanese_Maple.pdf



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

References

- Hardin, J., K. Kamminga, K. Maguylo. New Pest Response Guidelines: Tremex Wood Wasp (*Tremex fuscicornis*). United States Department of Agriculture, Animal and Plant Health Inspection Service. Accessed 12-24-12
 - http://www.aphis.usda.gov/import_export/plants/manuals/emergency/downloads/nprg-TremexWoodWasp.pdf
- Harrison, N. and M. Elliot. 2009. Texas Phoenix Palm Decline. University of Florida, Institute of Food and Agricultural Sciences. Accessed 12-24-12
 - <http://edis.ifas.ufl.edu/pp163>
- Haugen, D. and E. Hoebeke. 2005. Sirex woodwasp— *Sirex noctilio* F. (Hymenoptera: Siricidae). United States Department of Agriculture, Forest Service. Accessed 12-25-12
 - http://www.na.fs.fed.us/spfo/pubs/pest_al/sirex_woodwasp/sirex_woodwasp.htm
- Henricot, B., A. Pérez Sierra, and C. Prior. 2000. A new blight disease on *Buxus* in the UK caused by the fungus *Cylindrocladium*. Plant Pathology 49: 805.
- Henricot, B. and A. Culham. 2002. *Cylindrocladium buxicola*, a new species affecting *Buxus* spp, and its phylogenetic status. Mycologia 94(6): 980-997.
- Hoddle, Mark. 2013. Has the Red Palm Weevil Gone Extinct in Laguna Beach? - CISR Blog (Center for Invasive Species Research). Accessed 7/11/2013 -
 - <http://cizr.ucr.edu/blog/red-palm-weevil/palm-removal-in-laguna-beach/>
- Hopkins, J., T. Walkingstick, and J. Wallace. 2007. Invasive Woodwasp, *Sirex noctilio*: A Potential Pest of Pines in Arkansas. University of Arkansas Cooperative Extension. Accessed 12-25-12
 - http://www.uaex.edu/Other_Areas/publications/PDF/FSA-7071.pdf
- Inserra, R., J. Stanley, G. Hodges, R. Giblin-Davis. 2010. The Red Ring Nematode, *Bursaphelenchus cocophilus* (Cobb, 1919) *Baujard*, 1989 (Nematoda: Tylenchida). Florida Department of Agriculture and Consumer Sciences, Division of Plant Industry – Pest Alerts. Accessed – 1-7-12
 - <http://www.freshfromflorida.com/pi/pest-alerts/pdf/bursaphelenchus-cocophilus.pdf>



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

References

- Invasive Species Specialist Group, Global Invasive Species Database. 2007. *Sirex noctilio* (insect). Accessed 12-25-12
 - <http://www.issg.org/database/species/ecology.asp?si=1211&fr=1&sts=&lang=EN>
- Kane, E. and R. Ochoa. 2006. Detection and Identification of the Red Palm Mite *Raoiella indica* (Ascari: Tenuipalpidae). United States Department of Agriculture, Agricultural Research Service. Accessed 12-29-12
 - <http://www.sel.barc.usda.gov/acari/PDF/indicaGuide.pdf>
- Lesky, T. 2010. Sudden Emergence of Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål), as a Serious Agricultural Pest in the Mid-Atlantic. United States Department of Agriculture, Agricultural Research Service. Accessed 1-5-13
 - http://stream.ucanr.org/fps_stinkbug/index.html
- MacArthur, E. and G. Stovold. 2003. Chrysanthemum White Rust. New South Wales Agriculture. Accessed 11-9-12
 - http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/134863/chrysanthemum-white-rust.pdf
- Massachusetts Introduced Pest Outreach Project. 2008. Chrysanthemum White Rust Pest Factsheet. Accessed 11-9-12
 - <http://www.massnrc.org/pests/pestFAQsheets/chrysanthemumwhiterust.html>
- Michigan State University Extension. 2012. Boxwood blight disease identified in North America: *Claonectria pseudonaviculata* or *Cylindrocladium buxicola*. Accessed 11-10-12.
 - http://msue.anr.msu.edu/uploads/files/Boxwood_blight_TomDudek.pdf
- Miller, D., G. Miller, G. Hodges, and J. Davidson. 2005. Introduced Scale Insects (Hemiptera: Coccoidea) of the U.S. and their Impact on U.S. Agriculture. Proc. Entomol. Soc. Wash. 107 (1): 123-158.
- Ministry of Agriculture, British Columbia. 2012. Chrysanthemum White Rust. Accessed 11-9-12
 - <http://www.agf.gov.bc.ca/cropprot/cwrust.htm>
- Molet, T., A. L. Roda, and L. D. Jackson. 2011. CPHST Pest Datasheet for *Rhynchophorus ferrugineus*. USDA-APHIS-PPQ-CPHST.
- Molet, T., A. L. Roda, L. D. Jackson, and B. Salas. 2011. CPHST Pest Datasheet for *Rhynchophorus palmarum*. USDA-APHIS-PPQ-CPHST. accessed 7/11/2013 –
 - http://www.aphis.usda.gov/plant_health/plant_pest_info/palmweevil/downloads/Rhynchophoruspalmarum_v5.pdf

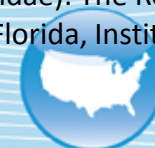


protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

References

- Monger, I. and C. Skellum. 2012. Bleeding Canker of Horse Chestnut. Arboricultural Information Exchange. Accessed 12-17-12
 - <http://www.aie.org.uk/vault/bcohc.htm>
- Murphy, S. T. and Briscoe, B. R. 1999. "The red palm weevil as an alien invasive: biology and the prospects for biological control as a component of IPM. Biocontrol News and Information, 20(1):34n-46n
- National Agricultural pest Information System – Pest Tracker. Brown marmorated stink bug. accessed 7/20/2013-
 - <http://pest.ceris.purdue.edu/map.php?code=IQAQQKA#>
- NAPIS Pest Tracker. Chrysanthemum White Rust. accessed 9/18/2013-
 - <http://pest.ceris.purdue.edu/map.php?code=FGARPKE#>
- North American Plant Protection Organization. 2001. *Tremex fuscicornis* Fabricius: Established populations recently discovered in Chile. Accessed 12-24-12
 - <http://www.pestalert.org/viewArchPestAlert.cfm?rid=55>
- North American Plant Protection Organization. 2006. *Planococcus minor* (Maskell). Accessed 12-24-12
 - <http://www.pestalert.org/viewNewsAlert.cfm?naid=20>
- OEPP/EPPO. 2005. *Rhynchophorus palmarum*. European and Mediterranean Plant Protection Organization. EPPO Bulletin 35, Pg 468-471.
- OEPP/EPPO. 2012. *Halyomorpha halys* (Heteroptera: Pentatomidae): Brown Marmorated Stink Bug. European and Mediterranean Plant Protection Organization. Accessed 1-5-13
 - http://www.eppo.int/QUARANTINE/Alert_List/insects/halyomorpha_halys.htm
- O'Keefe, G. and D.D. Davis. 2012. First confirmed report that *Puccinia horiana*, causal agent of Chrysanthemum White Rust, can overwinter in Pennsylvania. Plant Disease Vol 96, Issue 9, Pg 1381.
- Pena, J., C. Mannion, F. Howard, M. Hoy. 2006. *Raoiella indica* (Prostigmata: Tenuipalpidae): The Red Palm Mite: A Potential Invasive Pest of Palms and Bananas and Other Tropical Crops of Florida. University of Florida, Institute of Food and Agricultural Sciences. Accessed 12-29-12
 - <http://edis.ifas.ufl.edu/pdf/IN/IN68100.pdf>



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

References

- Royal Horticultural Society. 2012. Chrysanthemum White Rust. Accessed 11-15-12
 - <http://apps.rhs.org.uk/advicesearch/profile.aspx?pid=560>
- Royal Horticultural Society. 2012. Horse Chestnut Bleeding Canker. Accessed 12-17-12
 - <http://apps.rhs.org.uk/advicesearch/profile.aspx?pid=183>
- Ryan, K., P. De Groot, R. Nott, S. Drabble, I. Ochoa, C. Davis, S. Smith, and J. Turgeon. 2012. Natural Enemies Associated with *Sirex noctilio* (Hymenoptera: Siricidae) and *S. nigricornis* in Ontario Canada. Environmental Entomology 41(2): Pg 289-297.
- Sanagorski, L., and B. Schall. 2012. Downy Mildew on Impatiens. University of Florida, Institute of Food and Agricultural Sciences, Palm County Cooperative Extension. accessed 7/19/2013
 - <http://www.pbcgov.com/coextension/horticulture/commercial/pdf/DownyMildew.pdf>
- Sasakawa, M. 1961. A study of the Japanese Agromyzidae (Diptera) Part 2. Pacific Insects 3: 307-472
- Schubert, T.. 2012. Pest Alert: Downy Mildew of *Impatiens walleriana* caused by *Plasmopara obducens*. Florida Department of Agriculture and Consumer Services, Division of Plant Industry. accessed 7/19/2013
 - <http://www.freshfromflorida.com/pi/pest-alerts/pdf/downy-mildew-of-impatiens.pdf>
- Selness, A. and R. Venette. 2006. Minnesota Pest Risk Assessment: *Sirex noctilio* Fabricius [Hymenoptera: Siricidae]. Minnesota Department of Agriculture. Accessed 12-25-12
 - http://www.mda.state.mn.us/Global/MDADocs/pestsplants/insects/sirexwoodwasp_pra.aspx
- Smith, T., W. Dixon. Texas Phoenix Palm Decline in Florida. Florida Department of Agriculture and Consumer Sciences, Division of Plant Industry. Accessed 12-24-12
 - http://dpm.ifas.ufl.edu/plant_pest_risk_assessment/ALS6921%20Presentations/Texas%20Phoenix%20Palm%20Disease%20DPM%20Colloquium.pdf
- Steck, G. J. and G. L. Williams. 2011. "New Invasive Daylily Leafminer, *Ophiomyia kwansonis* Sasakawa, Identified in North America." NPDM First Detector Network News, Volume 6, Issue 9. accessed 7/19/2013
 - http://entnemdept.ufl.edu/hodges/september_2011.pdf



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

References

- Steck, G. J. and G. L. Williams. 2012. "Daylily Leafminer, *Ophiomyia kwansonis* Sasakawa (Diptera: Agromyzidae), new to North America, including Florida." Accessed 10-6-2012
 - <http://www.freshfromflorida.com/pi/pest-alerts/pdf/ophiomyia-kwansonis.pdf>
- Steele, H., B. Laue, G. MacAskill, S. Hendry, and S. Green. 2010. Analysis of the natural infection of European horse chestnut (*Aesculus hippocastanum*) by *Pseudomonas syringae* pv. *aesculi*. Plant Pathology 59: 1005-1013.
- Stocks, I. and A. Roda. 2011. Pest Alert. The Passionvine Mealybug, *Planococcus minor* (Maskell), a New Exotic Mealybug in South Florida (Hemiptera: Pseudococcidae). Florida Department of Agriculture and Consumer Services, Division of Plant Industry. Accessed 12-24-12
 - <http://www.freshfromflorida.com/pi/pest-alerts/pdf/planococcus-minor.pdf>
- Stocks, Stephanie and Amanda Hodges. 2011. A New Emerging Pest in Florida: European Pepper Moth (EPM). Updated September 2011. Accessed 12-25-12
 - <http://mrec.ifas.ufl.edu/Iso/dupon/default.asp>
- Stop BMSB. 2012. USDA-NIFA SCRI Coordinated Agricultural Project. Accessed 1-5-13
 - <http://www.stopbmsb.org/index.cfm>
- Texas Department of Agriculture. Texas Phoenix Palm Decline. Accessed 12-24-12
 - <http://www.texasagriculture.gov/RegulatoryPrograms/PlantQuality/PestandDiseaseAlerts/DatePalmLethalDecline.aspx>
- Thomas, Michael C., 2010. Giant Palm Weevils of the Genus *Rhynchophorus* (Coleoptera: Curculionidae) and Their Threat to Florida Palms. Florida Department of Agriculture and Consumer Sciences, Division of Plant Industry. Accessed 9/30/2012-
 - <http://www.freshfromflorida.com/pi/pest-alerts/pdf/giantpalmweevils.pdf>
- UMass Extension. 2012. Boxwood Blight Found in Massachusetts. Accessed 11-10-12
 - <http://extension.umass.edu/landscape/news/boxwood-blight-found-connecticut>



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

References

- University of Maryland Extension Service, Home and Garden Information Center. 2012. Brown Marmorated Stink Bug. Accessed 1-5-12
 - <http://www.hgic.umd.edu/content/brownstinkbug.cfm>
- USDA-APHIS. 2008. Proposed Program for the Control of the Woodwasp *Sirex noctilio* F. (Hymenoptera: Siricidae) in the Northeastern United States. United States Department of Agriculture, Animal and Plant Health Inspection Service. Accessed 12-25-12
 - http://www.aphis.usda.gov/plant_health/ea/downloads/SirexEA-final-northeast.pdf
- USDA-APHIS-PPQ-CPHST/NCSU. The 'box blight' pathogen: *Cylindrocladium pseudonaviculatum* = *Cylindrocladium buxicola* (Teleo. *Calonectria pseudonaviculata*). accessed 7/19/2013
 - http://www.ppd.l.purdue.edu/PPDL/pubs/Cylindrocladium%20pseudonaviculatum_v4.pdf
- USDA-APHIS-PPQ. 2012. Chrysanthemum White Rust Eradication Protocol for Nurseries Containing Plants Infected with *Puccinia horiana* Henn. Accessed 11-9-12
 - http://www.aphis.usda.gov/plant_health/plant_pest_info/cwr/downloads/cwrplan.pdf
- Venette, R. and E. Davis. 2004. Mini-Risk Assessment: Passionvine Mealybug: *Planococcus minor* (Maskell) [Pseudococcidae: Hemiptera]. University of Minnesota. Accessed 12-24-12
 - http://www.aphis.usda.gov/plant_health/plant_pest_info/pest_detection/downloads/pr/pminorpra.pdf
- Warner, D. 2011. Bleeding canker threatens horse chestnut. Irish Examiner. Accessed 12-17-12
 - <http://www.irishexaminer.com/opinion/columnists/dick-warner/bleeding-canker-threatens-horse-chestnut-164936.html>
- Welbourn, C. 2009. Pest Alert - Red Palm Mite *Raoiella indica* Hirst (Ascari: Tenuipalpidae). Florida Department of Agriculture and Consumer Services, Division of Plant Industry. Accessed 12-29-12
 - <http://www.freshfromflorida.com/pi/pest-alerts/raoiella-indica.html>
- Welty, C., D. Shetlar, R. Hammond, S. Jones, B. Bloetscher, and A. Nielsen. 2008. Brown Marmorated Stink Bug. Ohio State University Extension. Accessed 1-5-13
 - http://ohioline.osu.edu/hyg-fact/pdf/FS_3824_08.pdf



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests

References

- Zurko, J., 2011. Joining forces. GrowerTalks. accessed 9-February-2012
 - <http://ballpublishing.com/GrowerTalks/CoverStory.aspx?articleID=18917&highlight=zurko+impatiens+downy+mildew>



protect u.s.
community invasive species network

First Detectors Protecting U.S. from Pests